

UPPER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Arkansas River near Garden City
Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Middle Arkansas–Lake McKinney **Counties:** Finney, Kearny, Gray and
Arkansas–Dodge City Haskell

HUC 8: 11030001 **HUC 11 (HUC 14s):** **080** (010, 020, 030, 040, 050, 060)

HUC 8: 11030003 **HUC 11 (HUC 14s):** **010** (010, 020, 030, 040, 050)

Drainage Area: 545.5 square miles

Main Stem Segment: 1; ending at the outflow from defined drainage area in western Gray County; Upstream segment beginning in eastern Kearny County (**Figure 1**).

Designated Uses: Special Aquatic Life Support; Primary Contact Recreation; Domestic Water Supply; Food Procurement; Groundwater Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment

1998 303(d) Listing: Table 1 - Predominant Non-point Source and Point Source Impacts

Impaired Use: Primary and Secondary Contact Recreation on Main Stem Segment

Water Quality Standard: Fecal Coliform Bacteria: 900 colonies per 100 ml for Primary Contact Recreation in April-October (K.A.R. 28-16-283(c)(7)(B)) (disapproved); 2,000 colonies per 100 ml for Secondary Contact Recreation (K.A.R. 28-16-28e(c)(7)(C))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Secondary Contact Recreation.

Monitoring Sites: Station 286 near Pierceville

Period of Record Used: 1986 through 1999 (Station 286)(**Figure 1**)

Flow Record: Arkansas River at Garden City (USGS Station 07139000); 1986 to 1999

Long Term Flow Conditions: 10% Exceedence Flow = 370 cfs, 7Q10 = 1 cfs

Arkansas River near Garden City TMDL Reference Map

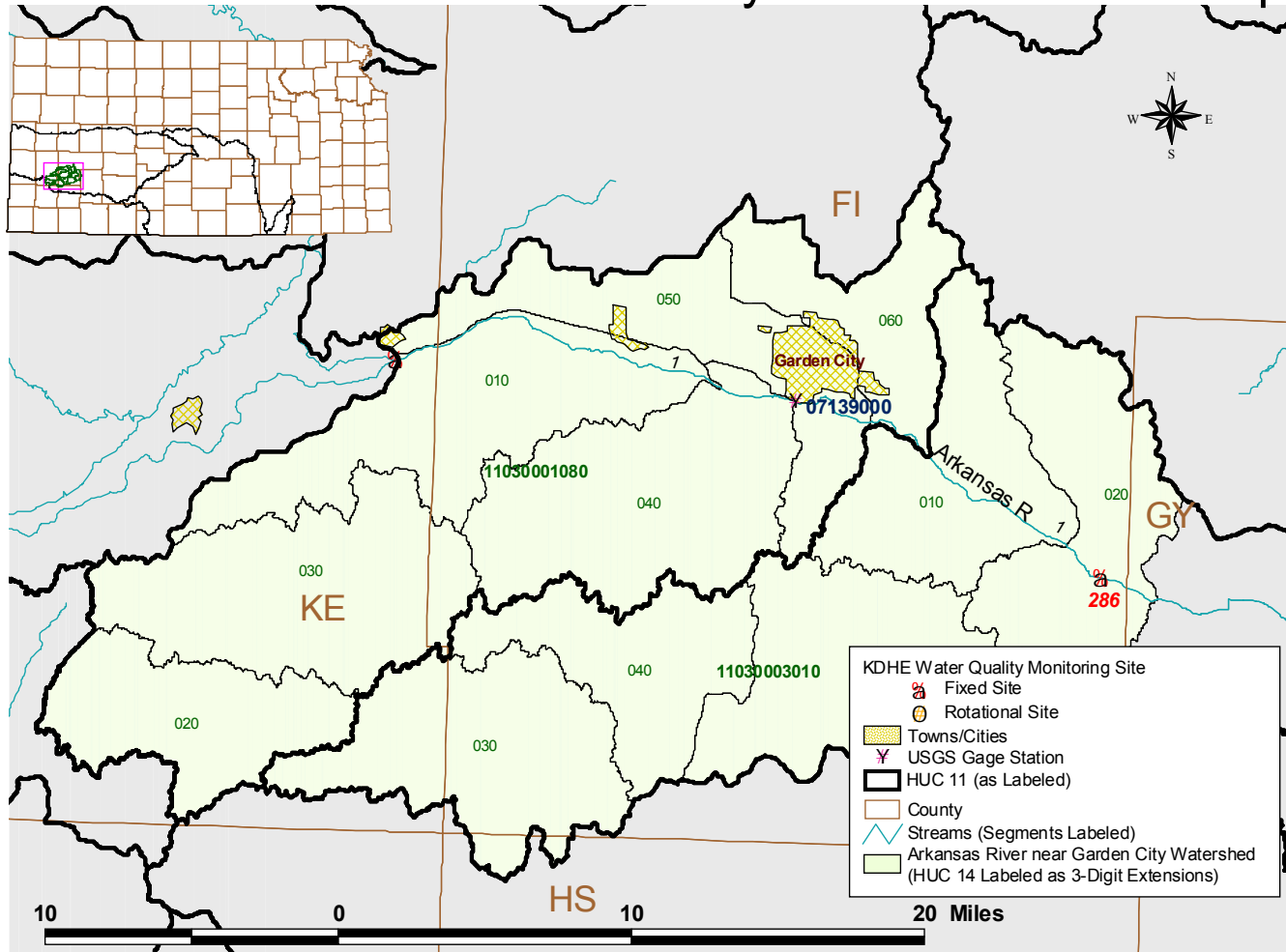


Figure 1

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were determined from the Garden City Station for each of the three defined seasons: Spring (Mar-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Feb). High flows and runoff equate to lower flow durations, baseflow and point source influences generally occur in the 75-99% range. Load curves were established for Primary and Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable

water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. These load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (**Figures 2, 3 and 4**).

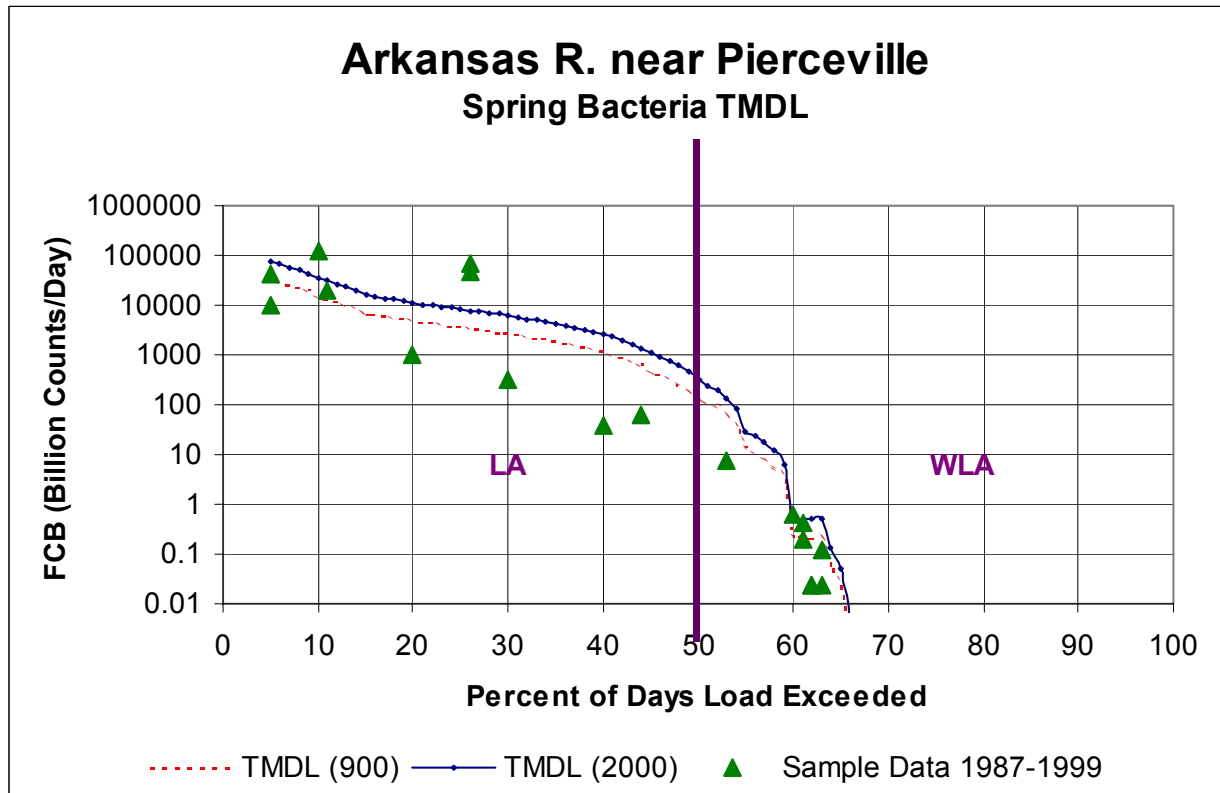


Figure 2

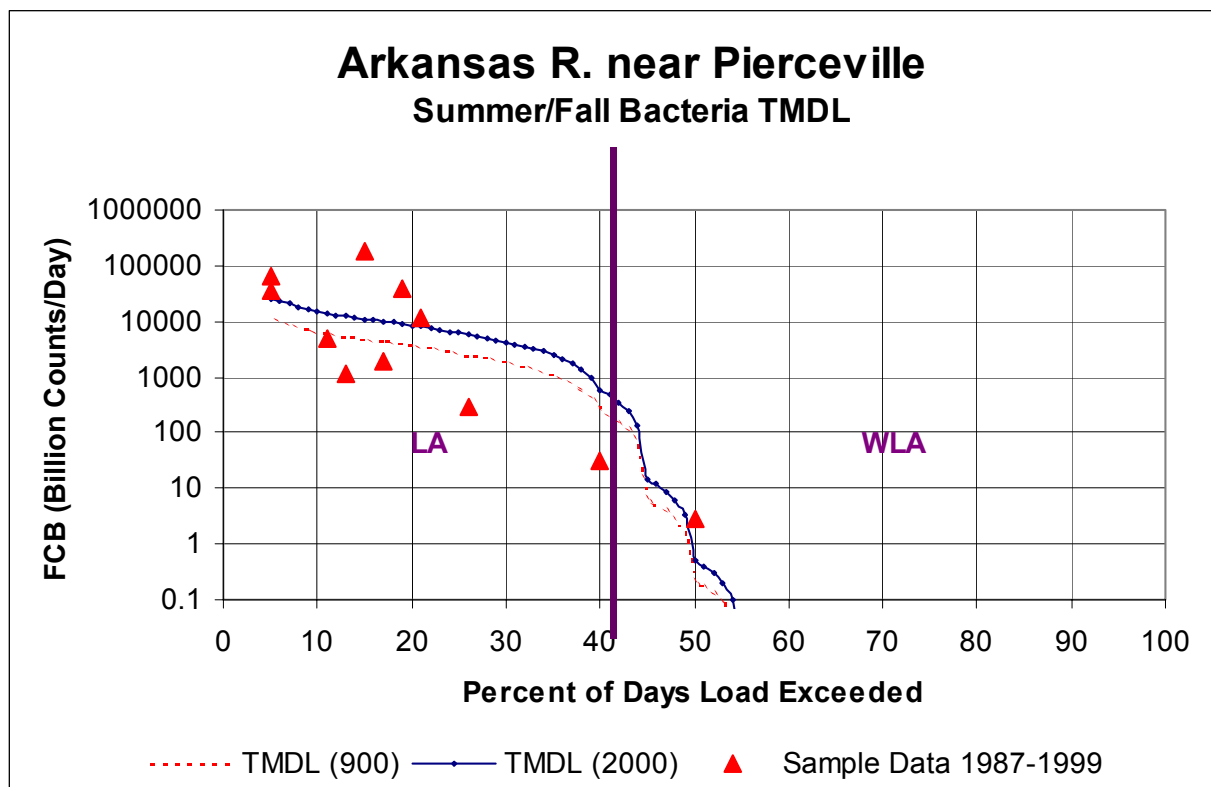


Figure 3

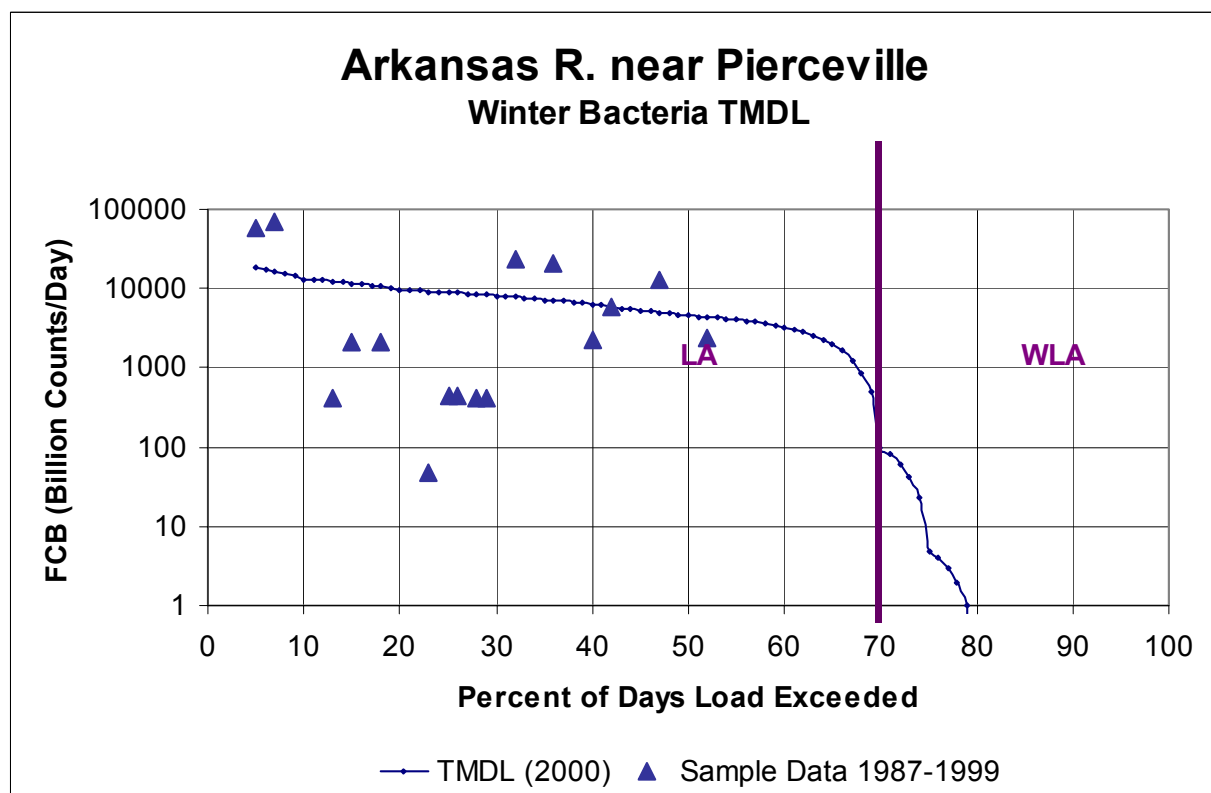


Figure 4

Excursions were seen in all three seasons. Twenty one percent of Spring samples and 55% of Summer-Fall samples were over the secondary contact criterion. Thirty one percent of Winter samples were over the secondary criterion. Overall 33% of the samples were over the criteria. This would represent a baseline condition of non-support of the impaired designated use.

NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 Cts/100mL BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Pierceville (286)	Spring	1	0	2	1	0	0	4/19 = 21%
	Summer	2	3	0	1	0	0	6/11 = 55%
	Winter	2	0	3	0	0	0	5/16 = 31%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 286 over 2005 - 2009:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting both Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas adopted a Primary Contact Recreation standard of 900 colonies per 100 ml but EPA subsequently disapproved that standard. This standard was used to establish a load duration curve shown in the TMDL curve. It is recognized, however, that the Primary Contact Recreation Standard will be revised in the future in accordance with national guidance. A revised Primary Contact Recreation TMDL curve will be established in Phase Two of this TMDL to reflect changes in this Standard. For Phase One the endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this Phase One load curve is also shown in the TMDL figure. The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 370 cfs. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint will be reached as a result of expected, though unspecified, reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoint indicate loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There is one NPDES permitted municipal wastewater discharger within the watershed (**Figure 5**).

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Garden City	Arkansas River	1	4 mgd	Mech.

Population projections for Garden City to the year 2020 indicate strong growth (38% increase from 1990). Projections of future water use and resulting wastewater appear to exceed design flows for the current system's treatment capacity. The excursions from the water quality standards appear to occur under all flow conditions. Of significance to point sources are the excursions under low flow in all seasons, especially during winter, indicating that point sources may have an impact under lower flows in the watershed.

Livestock Waste Management Systems: Twenty eight operations are registered, certified or permitted within the watershed (**Figure 5**). Eight facilities are located within a mile of the main stem. All these operations are beef. Potential animal units for facilities within one mile of the main stem total 74,389. Potential animal units for facilities in the watershed total 217,237. The actual number of animal units on site is variable, but typically less than potential numbers.

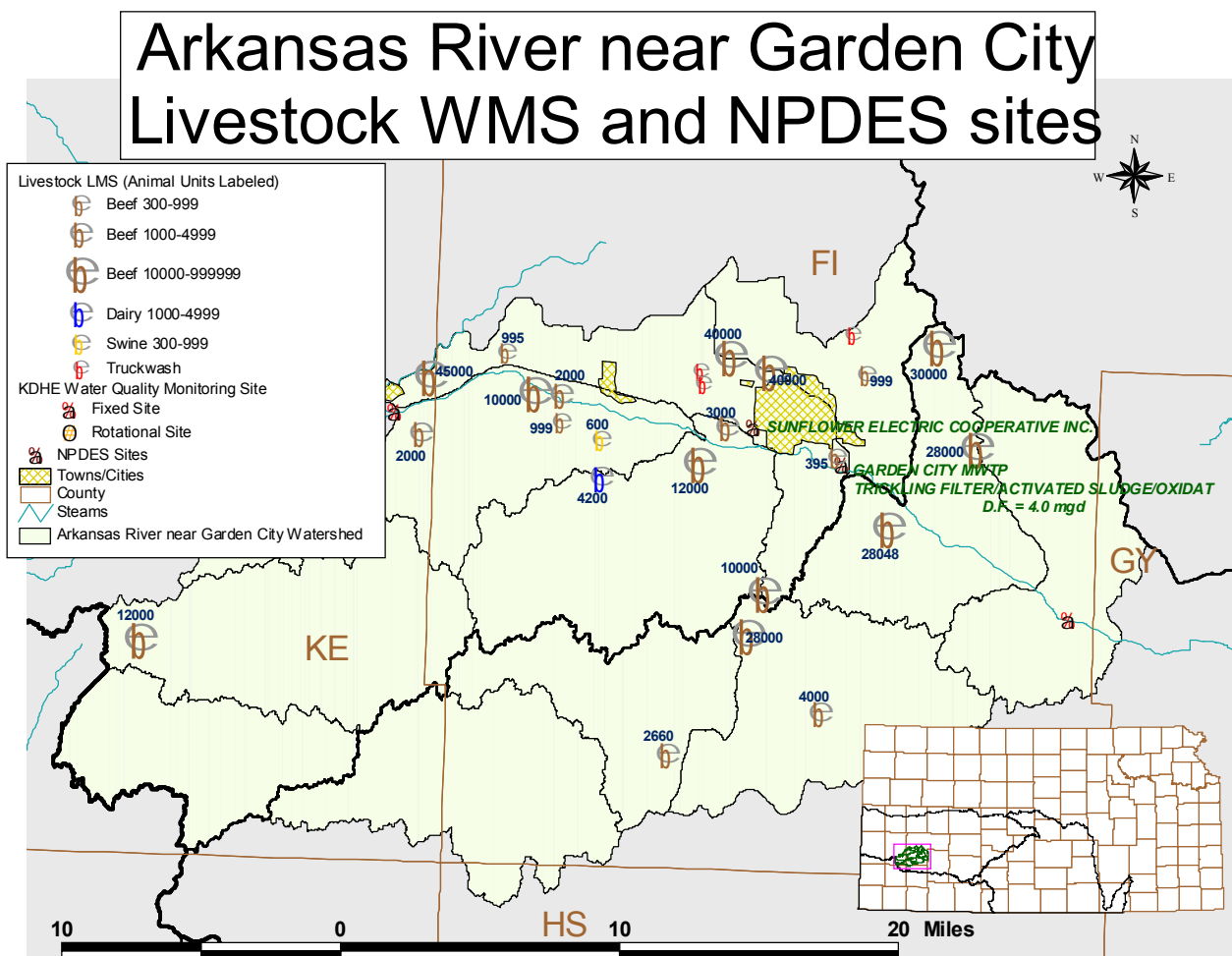


Figure 5

Land Use: Most of the watershed is cropland (63% of the area), grassland (35% of the area) or urban (2% of the area) (**Figure 6**). The off-season grazing density of livestock is low for the Upper/Lower Arkansas and Cimarron basins. About half of the watershed's growing season grazing density is average to high for those HUC14s within the watershed with high percentages of grassland, while the other half is comparably low for HUC14s with high percentages of cropland. The grassland is primarily located along and south of the main stem. Based on 1997 water use reports, at least 83% of the cropland in the watershed is irrigated.

Arkansas River near Garden City Land Use Map

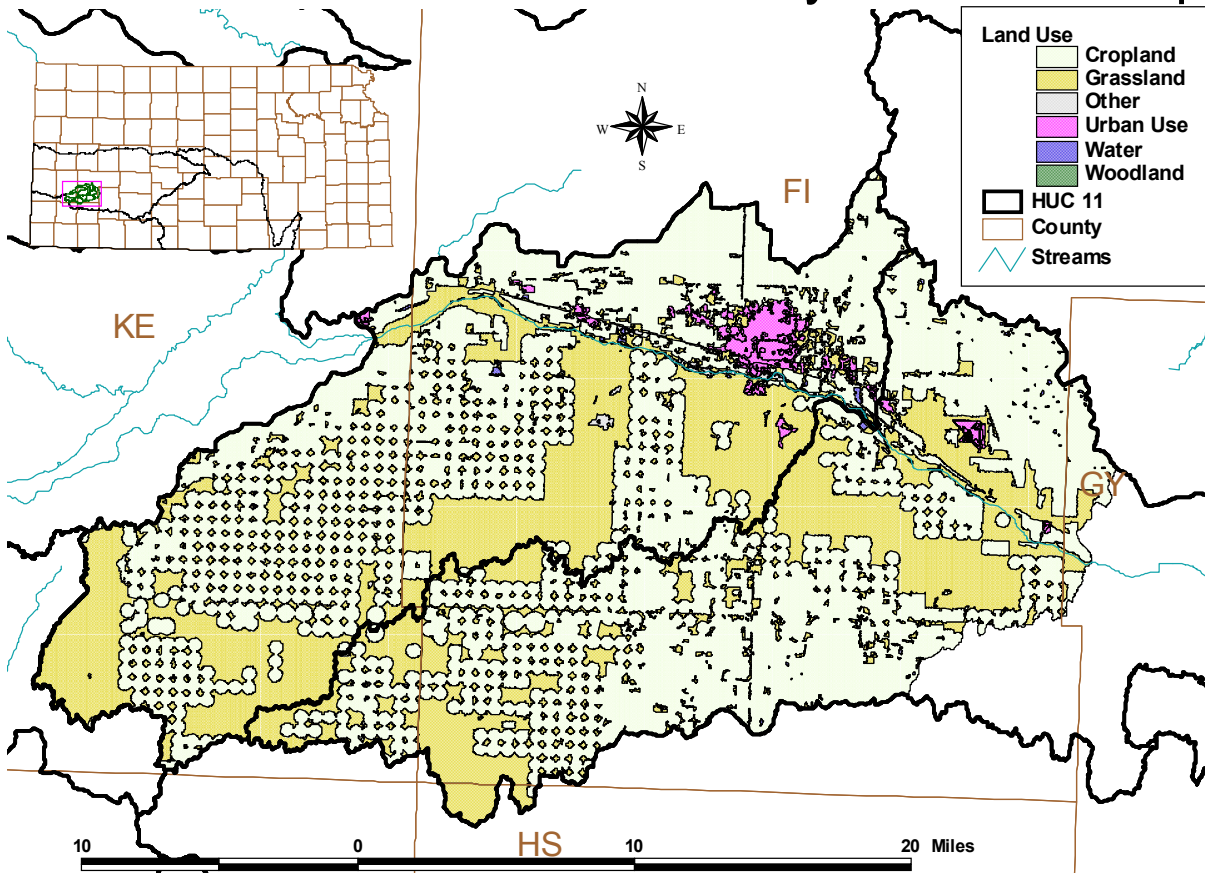


Figure 6

On-Site Waste Systems: The population density in the watershed south of the main stem is very low, 2 - 13 persons/sq. mi., while north of the main stem it is significantly higher, 44 - 407 persons/sq. mi.. Rural population projections for Finney County through 2020 show slight declines; projections for Kearny County show a small increase in the population. While failing

on-site waste systems can contribute bacteria loadings, their impact on the Arkansas River is somewhat limited, given the size of the rural population and magnitude of other sources in the watershed.

Background Levels: Some fecal bacteria counts may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer is fairly dispersed across the watershed resulting in minimal loading to the river below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and non-point loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or non-point sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of non-point sources up to the high flow exclusion value.

Point Sources: The point sources are responsible for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. Garden City now relies on trickling filter/activated sludge treatment system for its wastewater. The city is now constructing a new oxidation ditch system with UV disinfection to reduce bacteria in the effluent. Ongoing inspections and monitoring of the systems will be made to ensure that minimal contributions have been made by this source.

The Wasteload Allocation is defined at the flow condition of either one and a half times the design flow or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For the Arkansas River at this location, that flow condition would be flows of 0-10 cfs. Such flows have been exceeded 49-99% of the time during the Spring, 41-99% of the time over the Summer and Fall and 69-99% time in the Winter season. Future NPDES and state permits will be conditioned such that discharges from permitted facility will not cause violations of the applicable bacteria criteria at these low flows.

Non-Point Sources: Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to runoff conditions, non-point sources are also seen as a significant cause of water quality violations. Background levels are not significant as a cause of the problem. Implementation of non-point source pollution control practices should be taken within one mile of the river or any directly contributing tributary.

Activities to reduce fecal pollution should be directed toward the smaller, unpermitted livestock operations and rural homesteads and farmsteads along the river. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeding 10 cfs.

Defined Margin of Safety: Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below each seasonal TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

State Water Plan Implementation Priority: Because of the status of the river as one of the three public streams in the state and its regional significance and high probability of public contact, this TMDL will be a High Priority for implementation

Unified Watershed Assessment Priority Ranking: The upstream reach of this watershed lies within the Middle Arkansas–Lake McKinney (11030001) with a priority ranking of 31 (Moderate Priority for restoration work) and the primary portion of the watershed lies within the Arkansas - Dodge City (11030003) with a priority ranking of 8 (Highest Priority for restoration work).

Priority HUC 11s and Stream Segments: Until additional assessment is done on the main stem reach between 2000-2005, priority focus of implementation prior to 2005 will concentrate on disinfection at Garden City and installing best management practices adjacent to the main stream and directly contributing tributaries.

5. IMPLEMENTATION

Desired Implementation Activities

1. Renew state and federal permits and inspect permitted facilities for permit compliance
2. Install proper manure and livestock waste storage
3. Install grass buffer strips along tributaries.
4. Install pasture management practices, including proper stock density on grasslands
5. Remove winter feeding sites in proximity to streams
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main streams.

Implementation Programs Guidance

NPDES and State Permits - KDHE

- a. Municipal permits for facilities in the watershed will be renewed after 2002 with continuation bacteria monitoring and permit limits preventing excursions in bacteria criteria.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. Manure management plans will be implemented.

Livestock Program - KDHE

- a. Inspect permitted facilities to ensure minimal risk of discharge from waste systems to river.

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.
- c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC

- a. Develop improved grazing management plans
- b. Install livestock waste management systems for manure storage
- c. Implement manure management plans
- d. Install replacement on-site waste systems
- e. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

- a. Design winter feeding areas away from streams
- b. Develop riparian restoration projects

Buffer Initiative Program - SCC

- a. Install grass buffer strips near streams.
- b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Extension Outreach and Technical Assistance - Kansas State University

- a. Educate livestock producers on riparian and waste management techniques.
- b. Provide technical assistance on livestock waste management design.
- c. Continue Section 319 demonstration projects on livestock management.

Agricultural Outreach - KDA

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

Local Environmental Protection Program - KDHE

- a. Inspect on-site waste systems within one mile of main tributary streams.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds over the years 2001-2005, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be small livestock producers operating without need of permits within the priority watershed. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the streams including:

1. Facilities without water quality controls
2. Unpermitted permanent feeding/holding areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where livestock have full access to contributing tributaries and stream is primary water supply
5. Grazed acreage, overstocked acreage and acreage with poor range condition
6. Poor riparian sites
7. Near stream feeding sites
8. Failing on-site waste systems

Some inventory of local needs should be conducted in 2001 to identify such activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

Milestone for 2005: The year 2005 marks the mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for the facilities and sites cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from the seven monitoring stations should indicate evidence of reduced bacteria levels at median conditions relative to the conditions seen over 1987-1999.

Delivery Agents: The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension and agricultural interest groups such as Kansas Farm Bureau or Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Finney, Kearny, Gray and Haskell counties.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control non-point source pollution.
6. K.S.A. 82a-901, *et seq.* empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.
7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
8. The *Kansas Water Plan* and the Upper Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund, annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This TMDL is a High Priority consideration.

Effectiveness: Disinfection techniques within mechanical treatment plans have been very effective in reducing bacteria levels within wastewater effluent. Use of ultraviolet lights reduces bacteria counts to under 100 per 100 ml.

Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed.. The key to effectiveness is participation within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should voluntary participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1987-1999, the state may employ more stringent regulations on non-point sources in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 286, including fecal coliform samples over each of the three defined seasons during the initial implementation period. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the desired endpoints of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain at this phase if less than 10% of samples exceed the applicable criterion at flows under 370 cfs with no samples exceeding the criterion at flows under 225 cfs. Use of the real time flow data available at the Garden City stream gaging station can direct sampling efforts.

USGS should complete analysis of SSURGO soil data and 30-m resolution DEM topographic data to evaluate the relative runoff contributing areas within the watershed and provide greater resolution on where implementation activities would be most effective. This analysis should be complete in 2000.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2000 in order to support appropriate implementation projects.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Upper Arkansas Basin were held March 8 and April 24 in Garden City and April 25, 2000 in Great Bend. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Upper Arkansas Basin.

Public Hearing: A Public Hearing on the TMDLs of the Upper Arkansas Basin was held in Garden City on May 31, 2000.

Basin Advisory Committee: The Upper Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 11 and 24, 2000; March 8, 2000;

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Associated Ditches of Kansas: October 6, 1999; January 28, 2000; March 8, 2000; and April 24, 2000.
Agriculture: February 28, 2000
Environmental: March 9, 2000

Milestone Evaluation: In 2005, evaluation will be made as to the degree of implementation which has occurred along the Arkansas River. Subsequent decisions will be made regarding the implementation approach at that time.

Consideration for 303(d) Delisting: This watershed will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable criterion during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly. Once KDHE and EPA agree to an appropriate metric to evaluate Primary Contact Recreation and establish a water quality standard using such a parameter, this TMDL will be modified to incorporate that criterion.

At this phase of the TMDL, assessment for delisting will evaluate if the percent of samples over the applicable secondary contact recreation criterion is less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2005-2009. This assessment defines

full support of the designated use under water quality standards as measured and determined by current Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303d list. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations for implementation and monitoring under this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2001-2005.

Approved August 9, 2000